

## SECTION III.—FORECASTS.

## STORMS AND WARNINGS FOR OCTOBER.

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While there were no severe storms during the month there were a number of disturbances of more or less marked character that required warnings, the great majority of which, however, were small-craft warnings, and of the storm warnings ordered by far the greater portion was for the north Pacific coast.

On the 1st day of the month pressure was falling rapidly over the extreme north Pacific coast and during the afternoon and evening southeast and southwest storm warnings were ordered generally on the Washington and Oregon coasts. The storm moved rapidly into the interior with decreasing intensity and no high winds were reported after the evening of the 1st. Consequently warnings were ordered down on the morning of the 2d. At this time also there was a moderate disturbance over the Gulf of Mexico with a marked high pressure area over eastern New York. Small-craft warnings were therefore ordered at 10 a. m. from Savannah, Ga., to Norfolk, Va., and fresh to moderately strong winds occurred during the day. At 8 p. m. of the 2d the Gulf disturbance appeared to be a little more threatening and storm warnings were ordered at 9:30 p. m. from Savannah, Ga., to Fort Monroe, Va. There was no further development, however, and on the morning of the 3d the warnings were ordered down. There were still some evidences of the disturbance over the northern Gulf of Mexico, and small-craft warnings to this effect were issued. On the morning of the 4th there was a tropical disturbance near the mouth of the Yucatan Channel, accompanied by heavy rains but without winds of consequence, and advisory messages to this effect were at once sent to all coast stations between Boston and New Orleans. The disturbance did not develop materially and no further advices were necessary. During the 4th a well-marked disturbance from the northwest extended from North Dakota to eastern Colorado, and at 2 p. m. small-craft warnings for fresh to strong winds were ordered on Lake Superior from Duluth to Marquette, and on Lake Michigan at Escanaba and Green Bay. The disturbance rapidly disintegrated during the afternoon of the 4th and the warning was not justified. On the morning of the 6th there was a moderate depression some distance off the North Carolina coast with marked high pressure to the northward and small-craft warnings were therefore ordered for the extreme southern New England coast. These were followed by fresh to strong northeast winds.

On the morning of the 10th a middle Plateau disturbance of considerable energy had reached northern Illinois and small-craft warnings were ordered for the Lower Lakes. The disturbance moved northeastward to upper Michigan during the afternoon of the 10th and small-craft warnings on the Lower Lakes were fully justified. There were also some moderately strong winds on the Upper Lakes, but not sufficient to justify warnings for

west winds. On the morning of the 12th the entire western interior of the country was covered by an extensive area of high pressure with falling pressure near the mouth of the Rio Grande, and small-craft warnings were ordered on the Texas coast. The winds, however, did not attain more than a moderate velocity. On the same morning (12th) a disturbance was approaching the north Pacific coast, and at 7:15 a. m. southeast storm warnings were ordered on the northern Washington coast. No high winds occurred and on the morning of the 13th the warnings were changed to small craft and extended southward to the mouth of the Columbia River. On the morning of the 13th small-craft warnings were also ordered along the lower Lakes and the Atlantic coast from Norfolk, Va. to Nantucket, Mass., for the strong northeasterly winds that occurred during the day from a moderate depression over the Ohio Valley and a strong high area over Ontario. During the 15th a moderate depression moved into British Columbia from the Pacific Ocean and southwest storm warnings were ordered at 6:40 p. m. for the north Washington coast. Only moderately high winds occurred and on the following morning the warnings were changed to small craft and extended southward along the Oregon coast. On the 16th, however, there was a pronounced disturbance off the extreme north Pacific coast and southeast and southwest storm warnings were ordered during the morning from Cape Mendocino, Cal., northward. This disturbance caused high winds, as forecast, with a maximum velocity of 74 miles an hour from the southeast at North Head, Wash., during the 16th. During the 17th there was a redevelopment on the extreme north Pacific coast and at 6:40 p. m. southwest storm warnings were continued on the north Washington coast and extended southward to the mouth of the Columbia River. As the disturbance continued to develop warnings were further extended on the morning of the 18th to Cape Mendocino, Cal., and continued again at night from the mouth of the Columbia River northward. Severe gales resulted from this disturbance, the wind velocities on the Washington coast ranging from 60 to 76 miles an hour from the southeast and south. On the morning of the 19th the storm center passed into the interior and the warnings from the mouth of the Columbia River northward were changed to small-craft. At this time a moderate disturbance from the interior had reached southern New England, with fairly high pressure to the northeastward, and at 2 p. m. northeast storm warnings were ordered for the eastern Maine coast. A moderate, though very brief, northeast gale occurred during the afternoon and the warnings were lowered at 9 p. m.

On the morning of the 23d abnormally high pressure prevailed over New England, and moderately low pressure over the Gulf of Mexico, indicating the probability of strong northeast winds along the Atlantic coast and small-craft warnings were therefore ordered at 10 a. m. from Norfolk to Nantucket. There was also a moderate disturbance to the northward of Lake Superior and small-craft warnings were also ordered from Duluth to Marquette. Strong west to northwest winds prevailed

on Lake Superior, but along the Atlantic coast they were not more than fresh, although a short distance off the coast radio reports indicated strong easterly winds. Pressure had now been low for several days over the southern Gulf of Mexico and as there was a strong high pressure area to the northwestward, small-craft warnings were ordered on the morning of the 24th for the entire Gulf coast between the mouth of the Rio Grande and Carrabelle, Fla. Owing to the local situation small-craft warnings were also ordered at 11 a. m. on Lake Huron from Saginaw to Port Huron. During the 24th the Gulf disturbance appeared to develop somewhat, especially near the mouth of the Rio Grande, and northeast storm warnings were ordered at 10 p. m. for the Texas coast, and orders also issued to hoist small-craft warnings on the following morning eastward to Carrabelle, Fla. On the morning of the 25th there were evidences of quite marked development in the Gulf disturbance with its center apparently near the Yucatan Channel. The official in charge at Galveston, Tex., reported a high tide and rough sea, and storm warnings were therefore continued eastward so as to include the districts as far as Apalachicola, Fla. There were also indications of the development of a secondary disturbance off the North Carolina coast and small-craft warnings were therefore ordered from Norfolk to Nantucket; advisory messages were also sent to all display stations on the Florida coast between Carrabelle and Miami. The Gulf disturbance did not develop to any great extent, and it finally turned to the northeastward, passing over central Florida during the 26th. On the morning of the 27th it was central about 400 miles east of the Florida coast and from thence continued northeastward, passing the island of Bermuda in very moderate form during the night of the 27th. On the morning of the 26th a Canadian Northwest disturbance had reached the St. Lawrence Valley with fair development and was followed by a strong and cold high area. There were some moderately strong westerly winds on the Great Lakes, but none sufficient to justify warnings, except in the vicinity of Cleveland, Ohio, where the winds locally reached a velocity of 52 miles an hour from the north. A small-craft warning had been issued at this station during the morning of the 26th. Northwest storm warnings were ordered at 3:30 p. m. for the Lower Lakes, but they failed of verification. Another Canadian Northwest disturbance reached northern Lake Superior during the 27th with strong high pressure to the southward, and southwest storm warnings were ordered at 3:30 p. m. for Lake Superior and the northern portions of Lakes Michigan and Huron. Moderately strong winds occurred during the night of the 27th, but none of gale force, and at 9 a. m. of the 28th the warnings were ordered down. Small-craft warnings were ordered, however, at this time for the lower Lakes and strong southwest winds occurred during the day. On the morning of the 30th low pressure again prevailed off the north Pacific coast and small-craft warnings were ordered on the Washington and Oregon coasts, except at Marshfield, Oreg. Small-craft warnings were also ordered at New York City for the strong local northwest winds that occurred during the day following the passage of a moderately low area to the northward. There was at this time another Canadian Northwest disturbance moving eastward and by the morning of the 31st it was central north of Manitoba in quite well defined character with a strong and cold high area to the southeastward. Small-craft warnings were therefore ordered in the morning for the northern portion of the upper Lake region, and in the evening for the lower Lake region and southern Lake Huron.

## FROSTS AND WARNINGS.

Frosts were quite numerous during the month, and, unless otherwise indicated, it will be assumed here that they occurred as forecast.

On the 3d the barometer was quite low over the adjacent portions of Colorado, New Mexico, Utah, and Arizona with rising pressure to the northwestward, and freezing temperatures were forecast for the following morning over the high districts of New Mexico and Utah. Frosts were also forecast for northern and western Montana, and temperatures close to the freezing point with rain and snow occurred. On the morning of the 4th with marked low pressure prevailing in the Slope region, heavy frosts were forecast generally for Utah and west Colorado, and heavy frosts or freezing temperatures for east Colorado, Wyoming, west Nebraska, west Kansas and the Northwest generally. On the morning of the 5th light frost occurred as far south as Dodge City, Kans. On the morning of the 6th high pressure prevailed generally over the eastern portion of the country and frost warnings were issued for northern New England. This forecast was verified except along the immediate coast. On the 10th warnings of frost or freezing temperatures were issued for North Dakota, and frost warnings for the western upper Lake region, Iowa, Nebraska and northwestern Missouri. These warnings were not verified, owing to a rapid pressure fall over the central Rocky Mountain region. On the morning of the 11th the western disturbance had reached central Ontario and frost warnings were issued for eastern North Dakota, Minnesota, and low places in Wisconsin, and also for Michigan, north Indiana, north and central Ohio, and west Pennsylvania. These warnings also failed, owing to the rapid eastward movement of the western disturbance. This western disturbance was now central over Iowa and was followed by cold high pressure. Frost warnings were therefore issued on the 12th for Colorado, Kansas, Nebraska, Iowa, northwest Missouri, and the Texas panhandle, and warnings of frost or freezing temperatures for the Dakotas and Minnesota. These warnings were not verified east of the Missouri River, except in North Dakota, as on the morning of the 13th the disturbance persisted over the Ohio and upper Mississippi Valleys. At this time frost warnings were again issued for the Dakotas, west Minnesota, Kansas, west Missouri, Arkansas, Oklahoma, northwest Texas, and eastern New Mexico. On the morning of the 14th the disturbance still persisted over the Ohio Valley, though in very moderate form, and there were no frosts south of northern Nebraska, except in the Texas panhandle. Frosts also occurred in upper Michigan for which no warnings has been ordered, it having been assumed that cloudy weather would continue with the low area to the southward. Frosts were now forecast for eastern New Mexico, northwest Texas, the extreme north portion of east Texas, Oklahoma, northwest Arkansas, west Tennessee, northern Wisconsin, Michigan, Minnesota, Kansas, Nebraska, and extreme western Iowa. Owing to the persistence of the southern disturbance with the attendant cloudy and rainy weather these warnings also failed of verification, except in portions of Minnesota, Kansas, New Mexico, and adjacent portions of Iowa and South Dakota. On the morning of the 15th frost warnings were ordered for Minnesota, Nebraska, northwest Wisconsin, and northwest Iowa with good results. Similar warnings, however, for western Oklahoma and the north portion of west Texas were not justified. On the 16th frost warnings were issued for Nebraska, Kansas, and northwest Iowa, and on the 17th for west and central Iowa

and North Dakota and western Wisconsin, those of the 17th failing of verification.

On the morning of the 22d pressure was low over the western portion of the Dakotas and in the central Rocky Mountain region with rapidly rising pressure to the northwestward, and frost warnings were ordered for northwest Colorado. Although pressure was abnormally high to the northward, temperatures did not fall materially and the forecast failed. On the morning of the 23d pressure was moderately low from northwest Iowa to western Lake Superior and abnormally high to the westward, and warnings of frost and freezing temperatures were therefore issued for northern and western Minnesota, and warnings of frost for eastern New Mexico, the latter failing of verification owing to rain. On the morning of the 24th the northwest high area had increased somewhat in intensity and there was only a moderate low area over the extreme Northeast; frost warnings were therefore issued for Nebraska, northern and western Kansas, eastern New Mexico, the Texas panhandle, western Oklahoma, northern Iowa, Wisconsin, Minnesota, and Michigan, with excellent results from the forecast standpoint. On the morning of the 25th low pressure prevailed along the Middle and South Atlantic

coasts, over the Gulf of Mexico and to the northward of Lake Superior with high pressure over the central West, and frost warnings were ordered for the central West, the Ohio Valley, and the Lake region generally. Freezing temperatures occurred in the Lake region and extreme upper Mississippi Valley on the following morning, but there were no frosts to the southward. On the 26th another strong high-pressure area had reached to the Dakotas and there was a well-defined low area over the St. Lawrence Valley. Frost warnings were then issued for the Southwest, the central West, the Ohio Valley, the Lake region, and the Middle Atlantic States. These forecasts were followed by heavy to killing frosts and freezing temperatures, except in New Jersey, Maryland, and southern portions of eastern Pennsylvania. On the morning of the 27th, with the tropical disturbance off the Florida coast and strong, cold high pressure over the interior of the country, general frost warnings were issued for the entire East and South, as far south as northern Florida, and on the morning of the 28th frost occurred to the east Gulf coast. Another warning was issued on the 28th for the frosts that occurred on the morning of the 29th in Georgia and South Carolina.